
Winter 2012-13 Outlook
National Weather Service Gaylord

Anticipated northern Michigan snow depth by the end of February

Overview

- ENSO Cycle and What it All Means
- Analog Years for this Season's Forecast
- "Normal" Winter Weather
- The NAO: A Wildcard in the Mix
- Does CPC Agree with Us?

El Nino/Southern Oscillation (ENSO)

Definition:

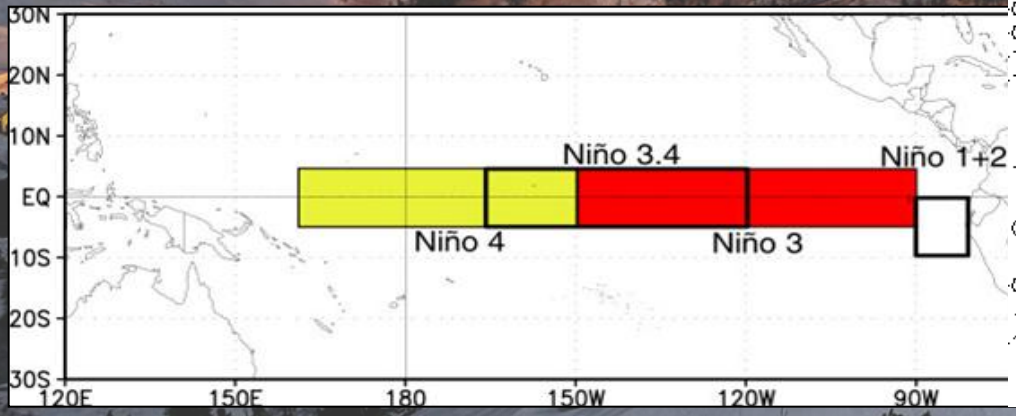
- Periodic change in the ocean temperatures of the tropical Pacific
- The warming or cooling of surface waters of the tropical central and eastern Pacific Ocean (between 5ºS and 5ºN of the equator/160ºE to 80ºW)
- ***El Niño*** is the warm phase; ***La Niña*** is the cool phase
- Anomalies of at least 0.5ºC must be recorded for 5 consecutive months
- Currently experiencing neutral ENSO conditions with a transition to a weak *El Niño* possible, but not likely

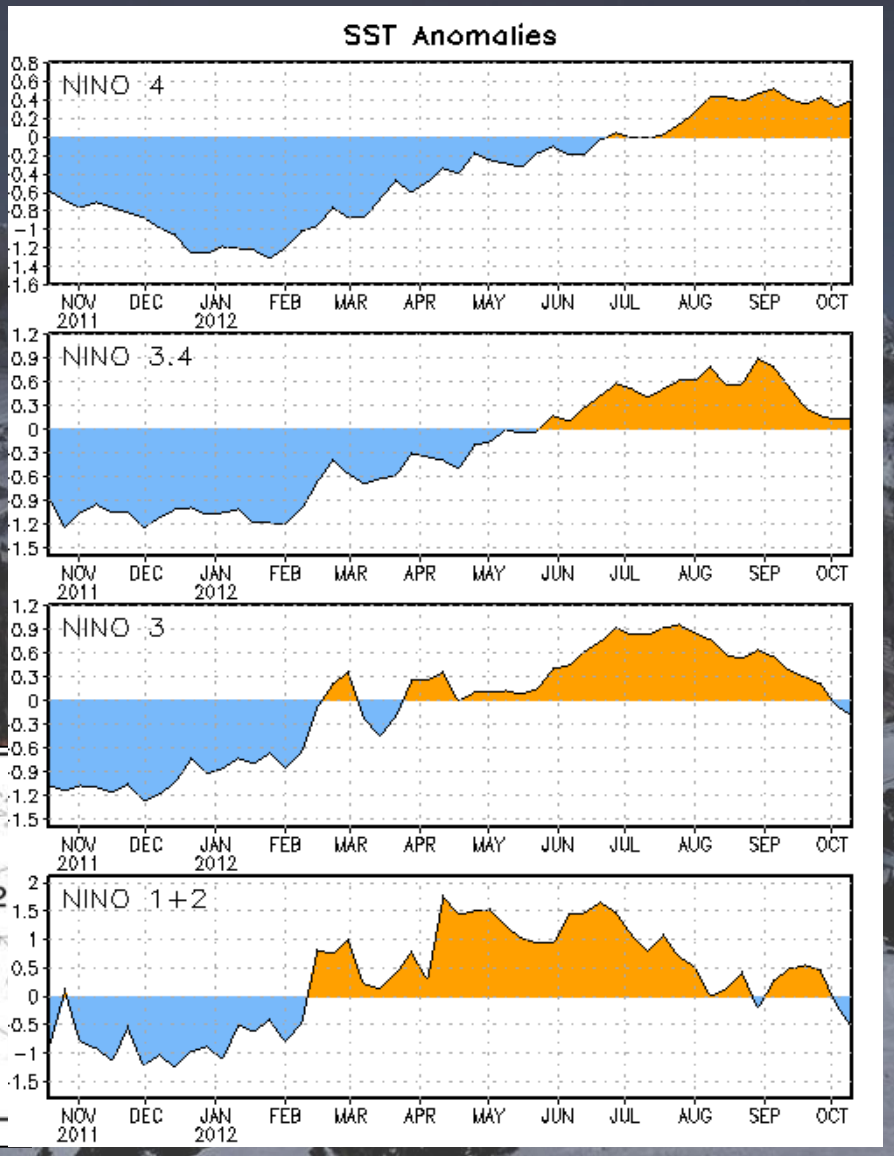
Niño Region SST Departures (ºC)

Recent Evolution

The latest weekly SST departures are:

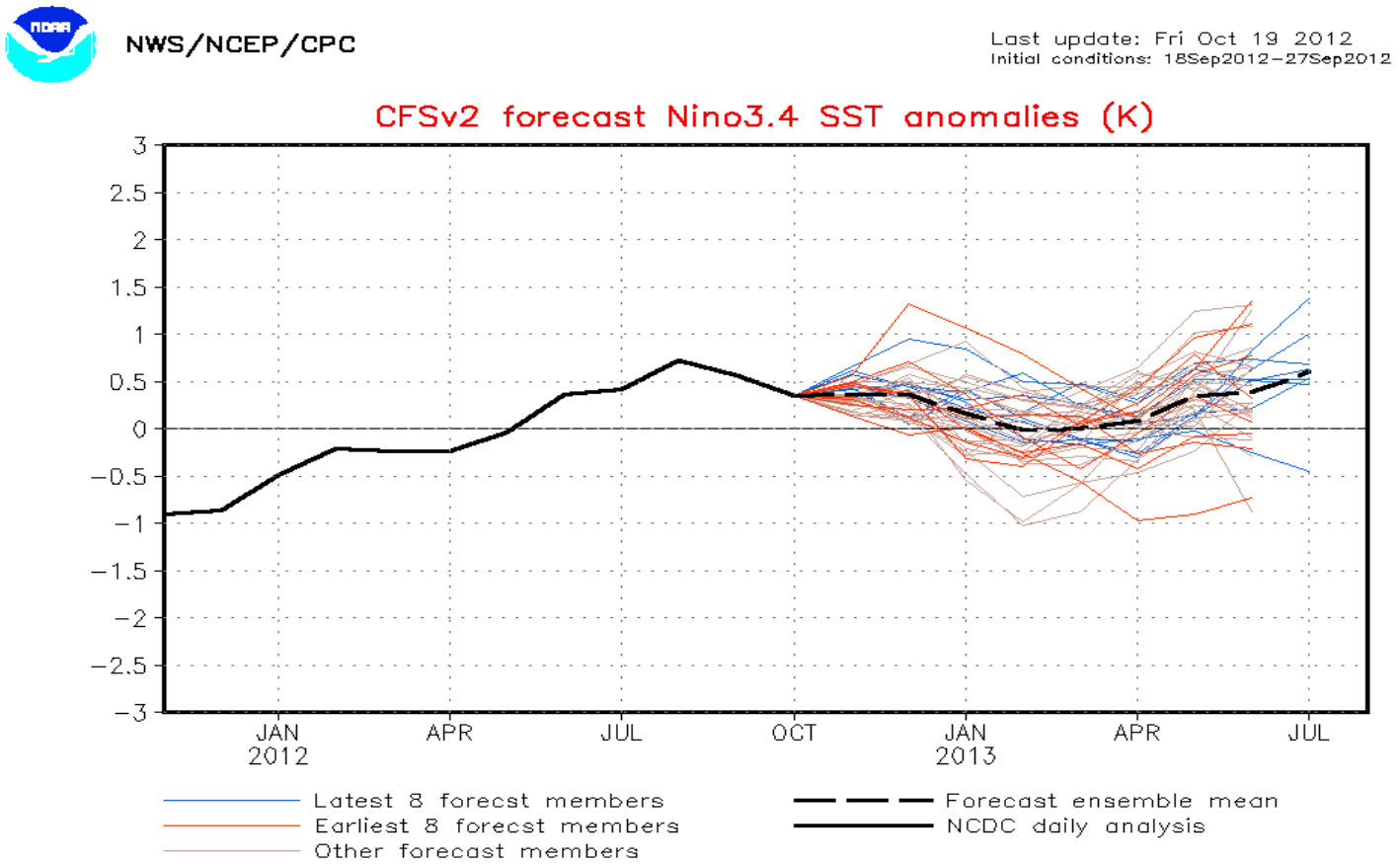
Niño 4	**+0.4ºC**
Niño 3.4	**+0.1ºC**
Niño 3	**-0.2ºC**
Niño 1+2	**-0.5ºC**



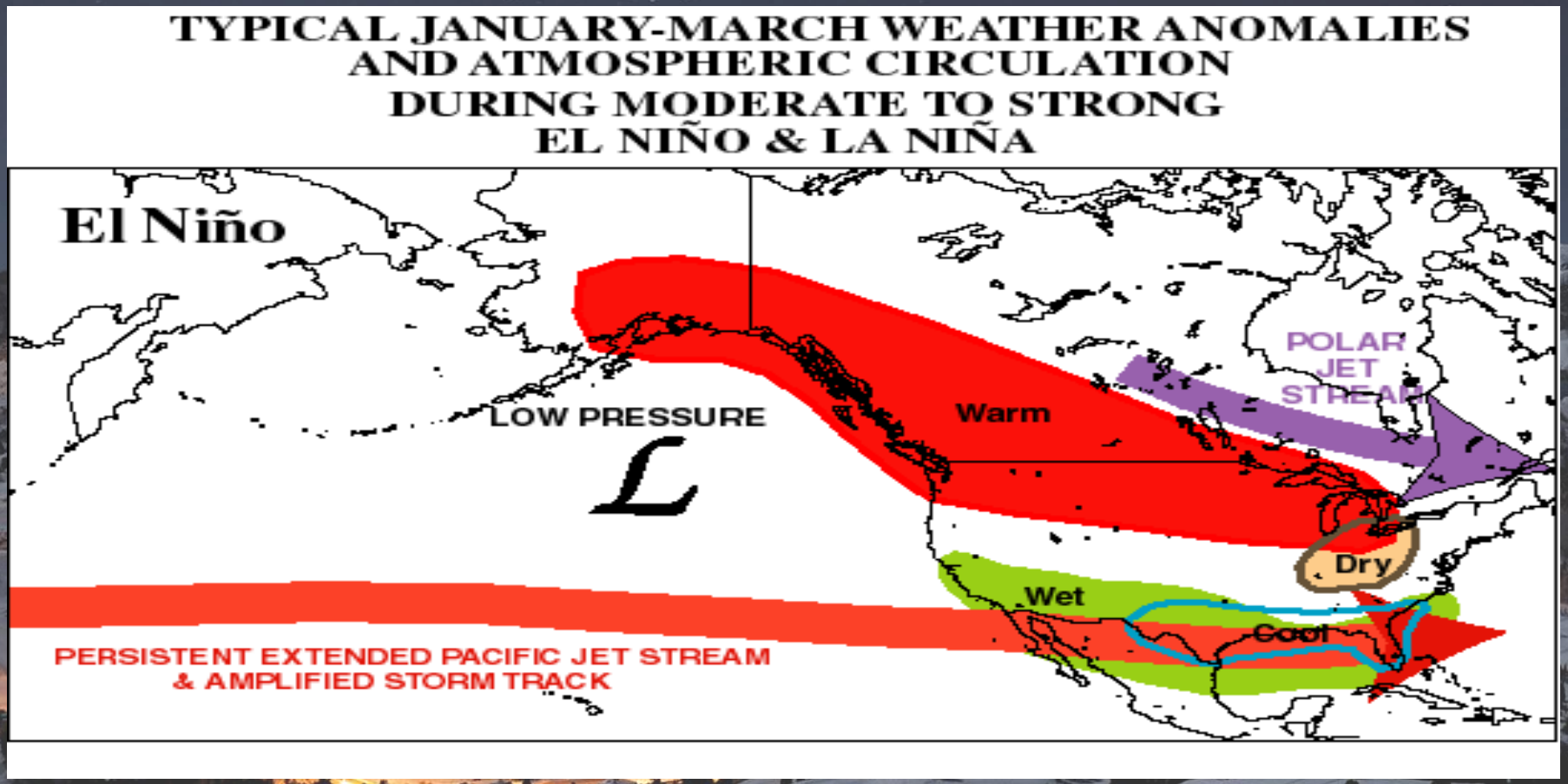


Niño 3.4 Region SST Outlook

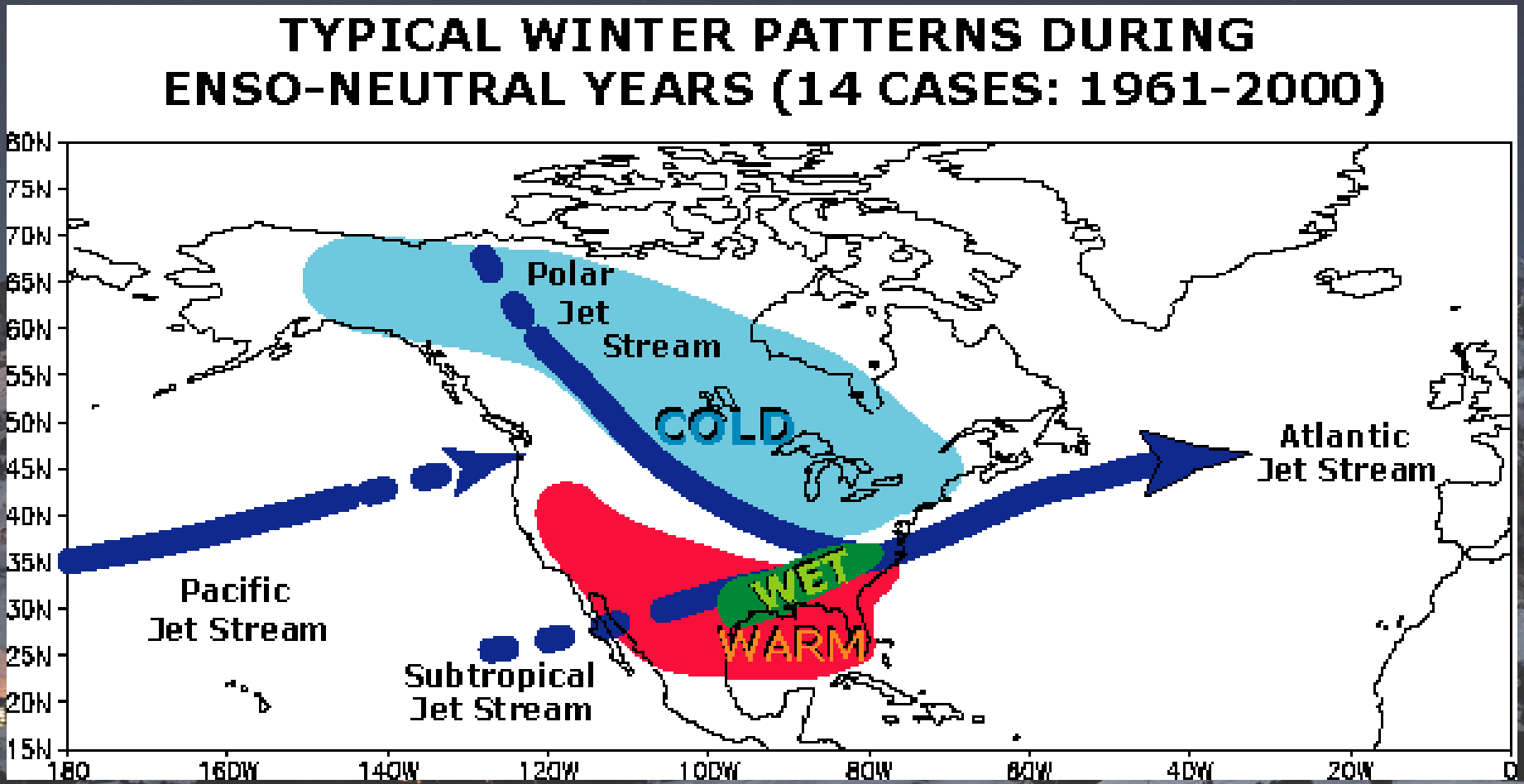
- Neutral conditions are currently being observed, with a notable decline since late summer.
- Latest trends support neutral to weak El Niño conditions through the spring.



Typical El Niño Results for the U.S.



Typical Neutral ENSO Results for the U.S.



Setup During El Niño Episodes

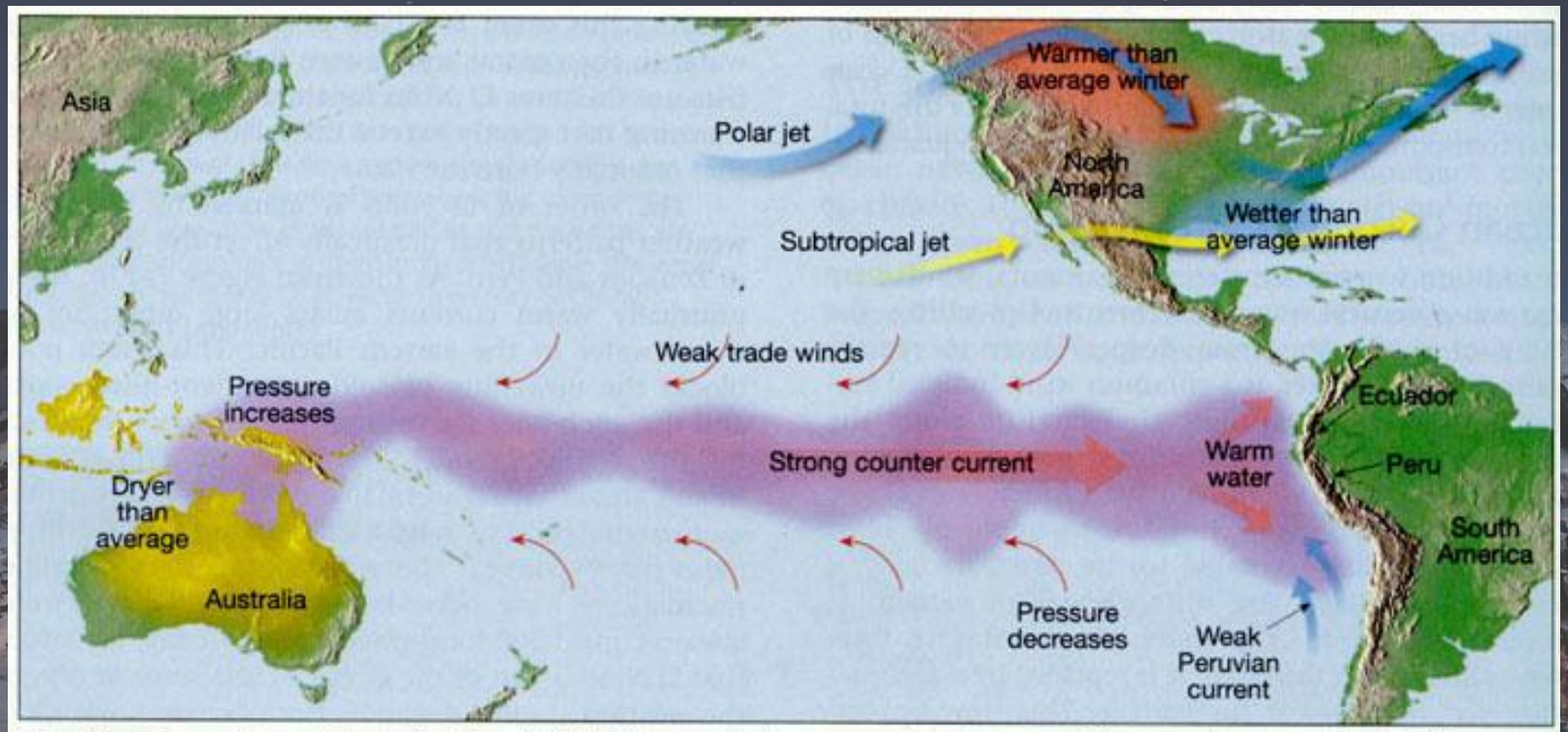


Fig.14 Upon the advent of an ENSO event, the pressure over the eastern and western Pacific flip-flops. This causes the trade winds to diminish, leading to an eastward movement of warm water along the equator. As a result, the surface waters of the central and eastern Pacific warm, with far-reaching consequences to weather patterns.

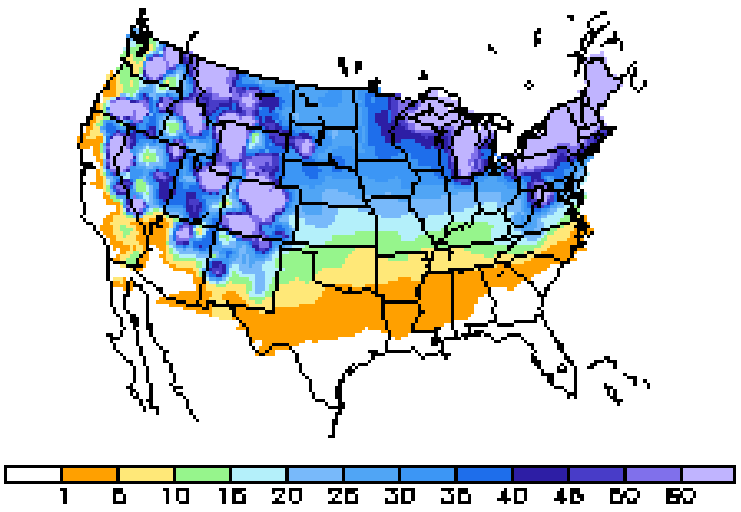
Snowfall (Inches; 1948–1993)

November thru March

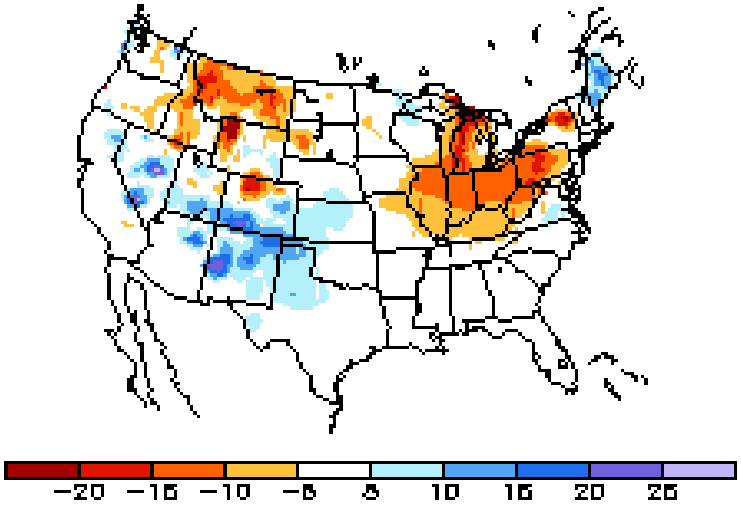
7 El Nino Years *
8 La Nina Years *
19 Neutral Years

* Moderate & Strong events only

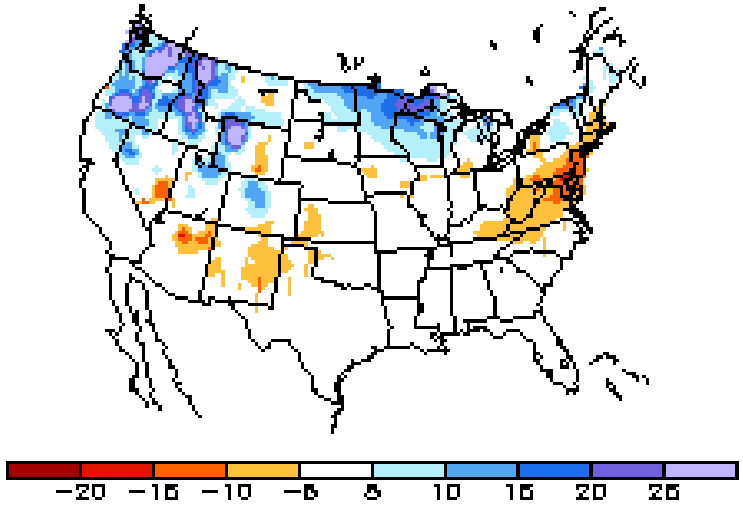
Neutral Year Mean



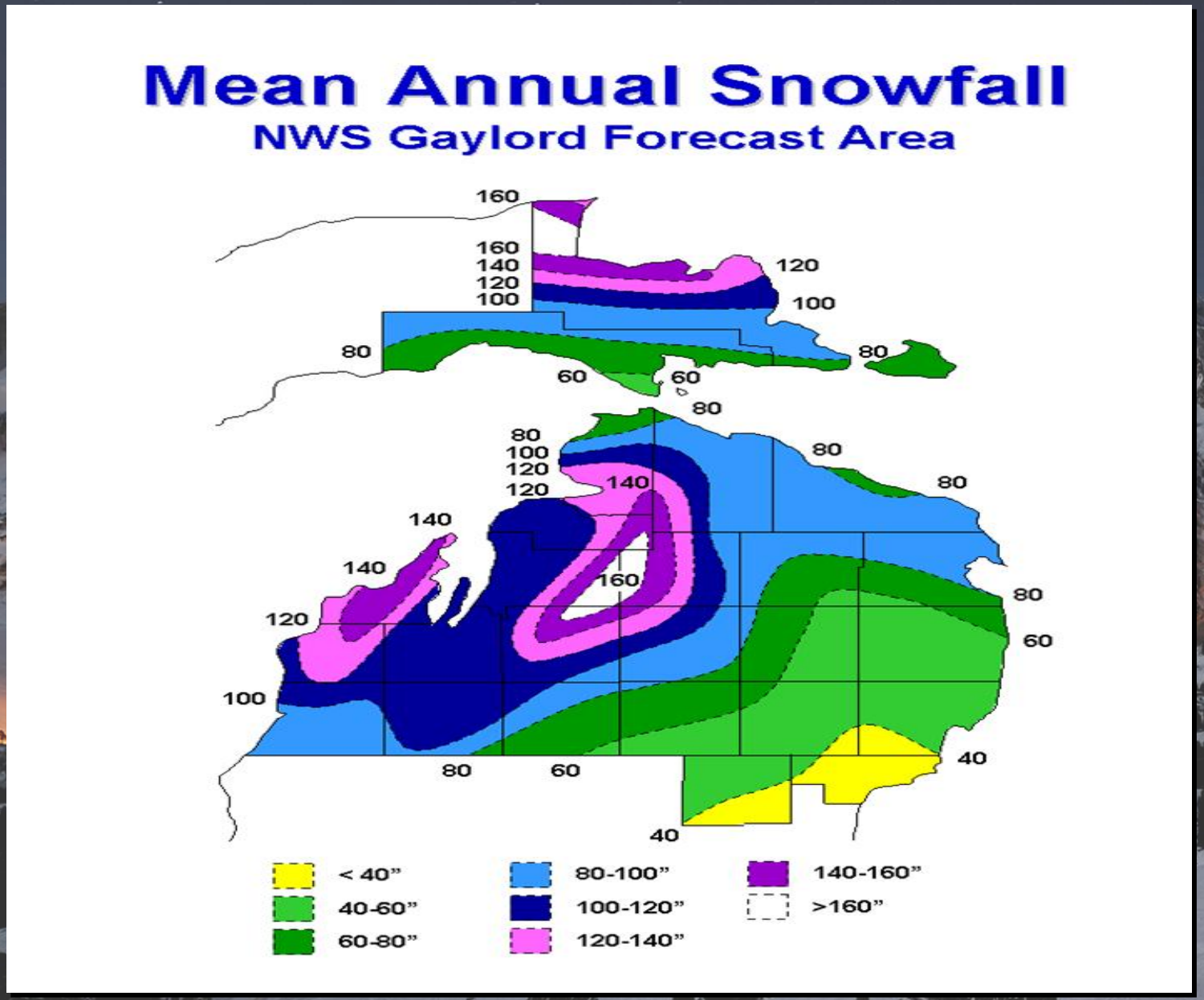
El Nino mean – Neutral mean



La Nina mean – Neutral mean



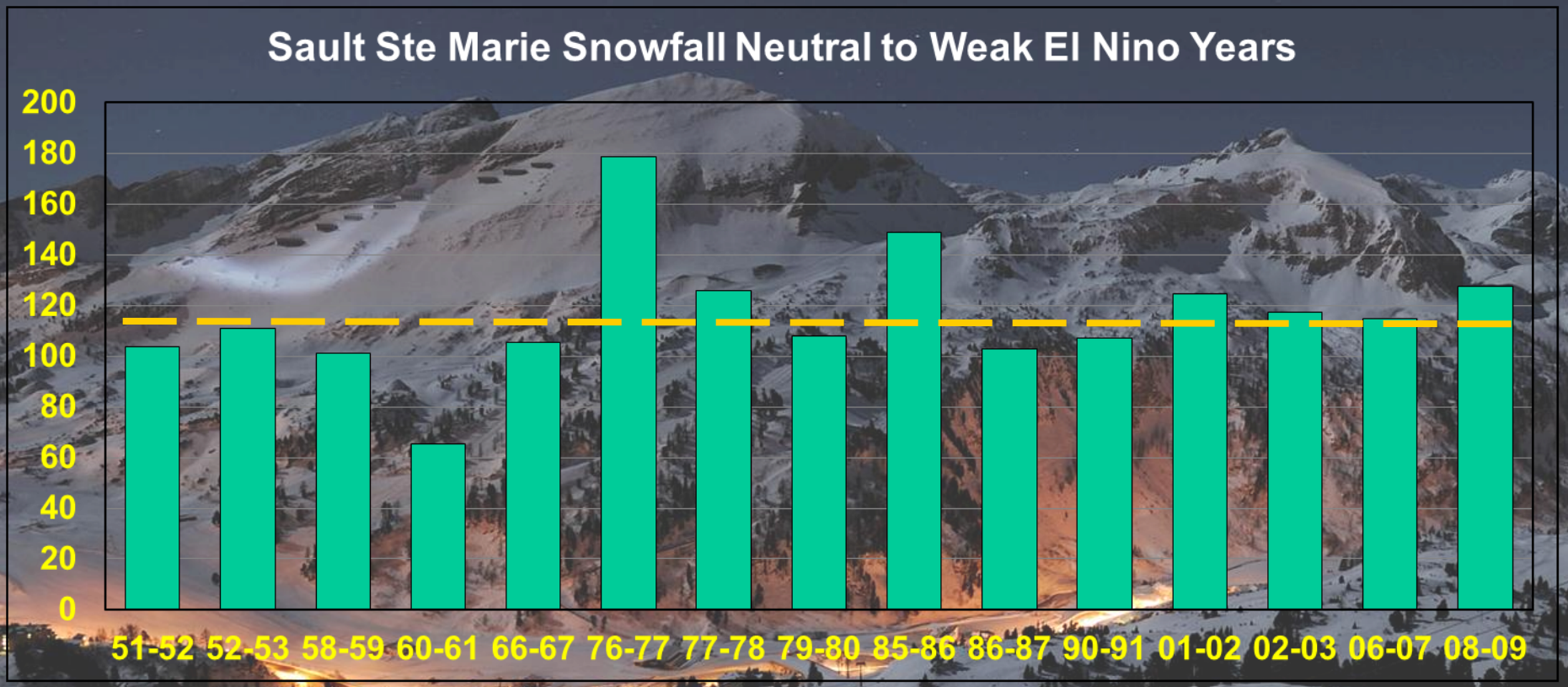
Average Northern Michigan Snowfall



Using the Past to Forecast the Future

- **Analog forecasting – using similar previous seasons or ENSO/blocking setups to forecast the coming season**
  - ***In this case, we used years in which back to back weak to moderate La Nina's occurred were followed by neutral to weak El Nino's.***
  - ***Quite a few years since 1950 when this has happened: 1951-52, 1952-53, 1958-59, 1960-61, 1966-67, 1976-77, 1977-78, 1979-80, 1985-86, 1986-87, 1990-91, 2001-02, 2002-03, 2006-07, 2008-09***

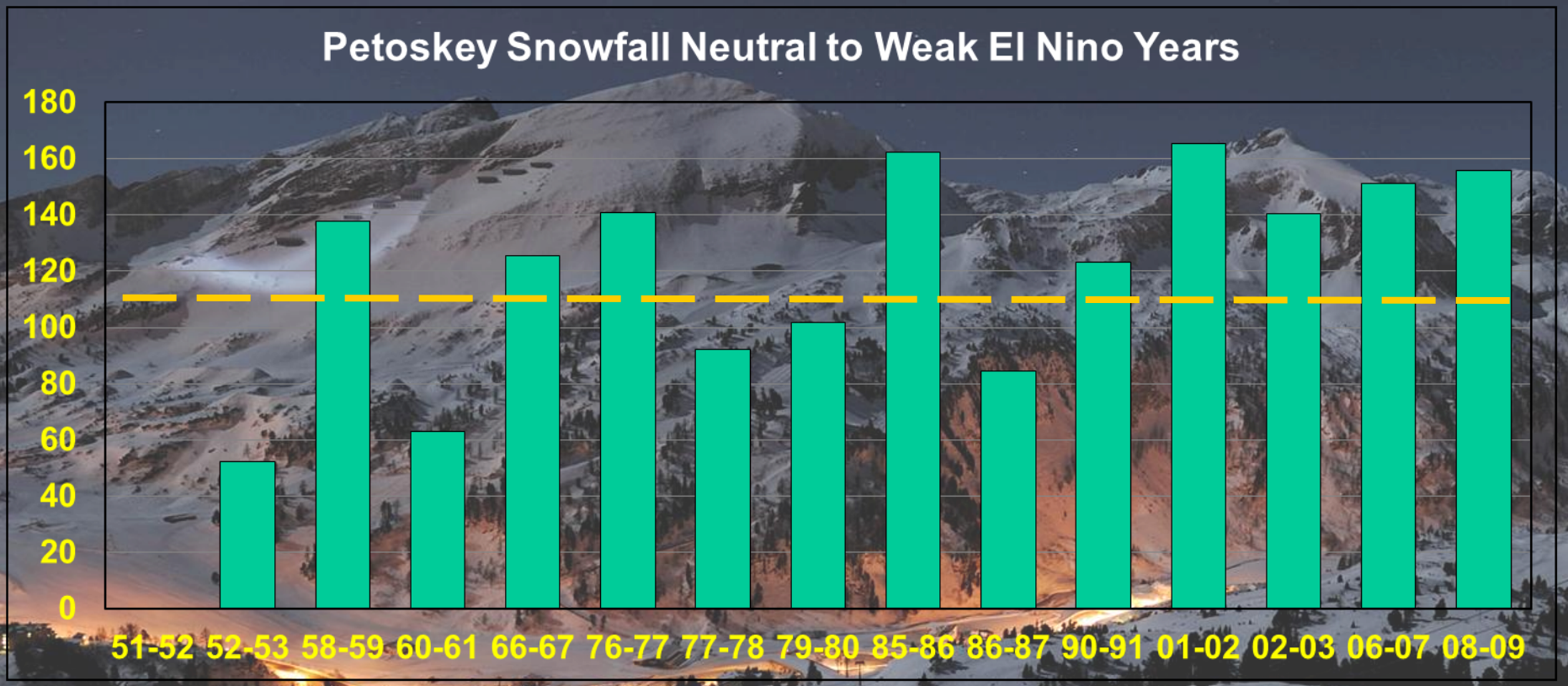
Let's Look at Some Snowfall Data



Long Term Average (1950-2011): 116.6"

Average for Analog Years: 116.1"

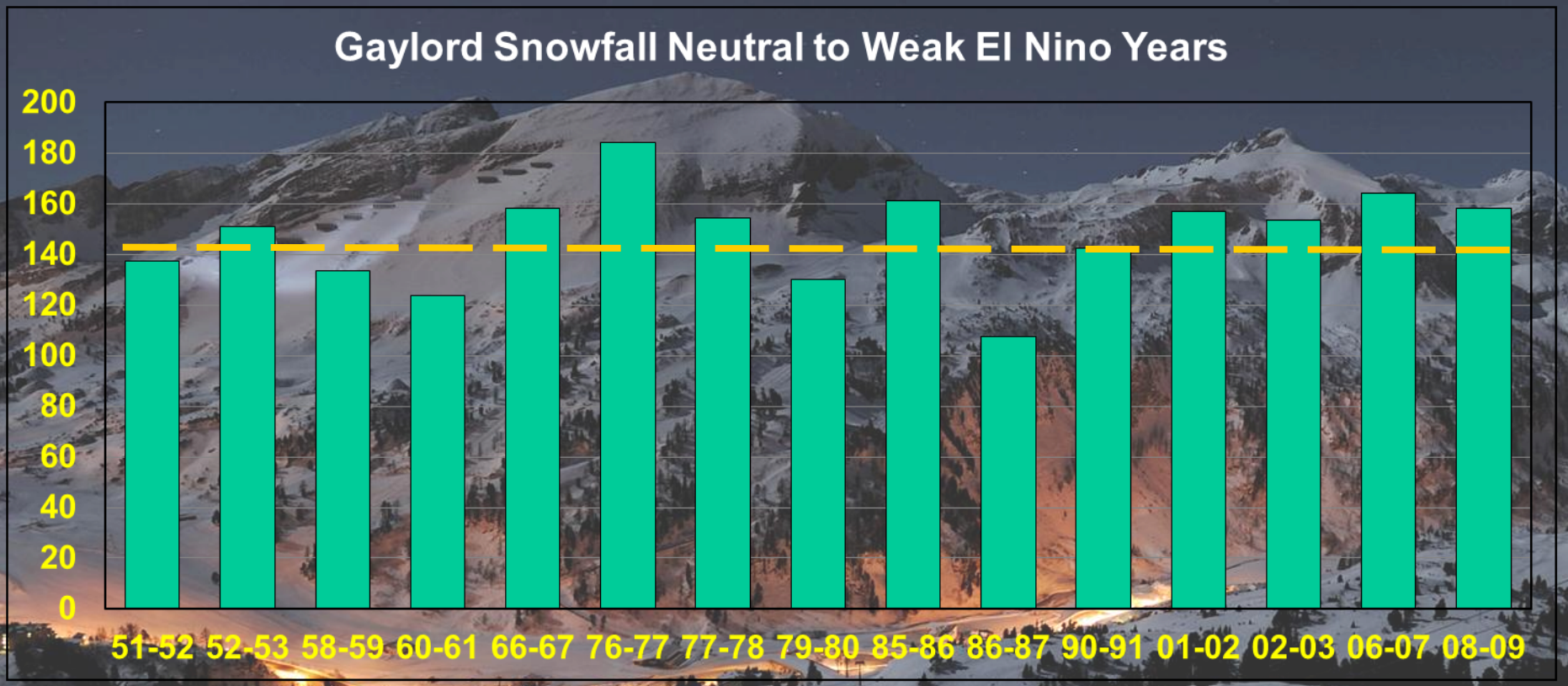
Let's Look at Some Snowfall Data



Long Term Average (1950-2011): 111.1"

Average for Analog Years: 121.1"

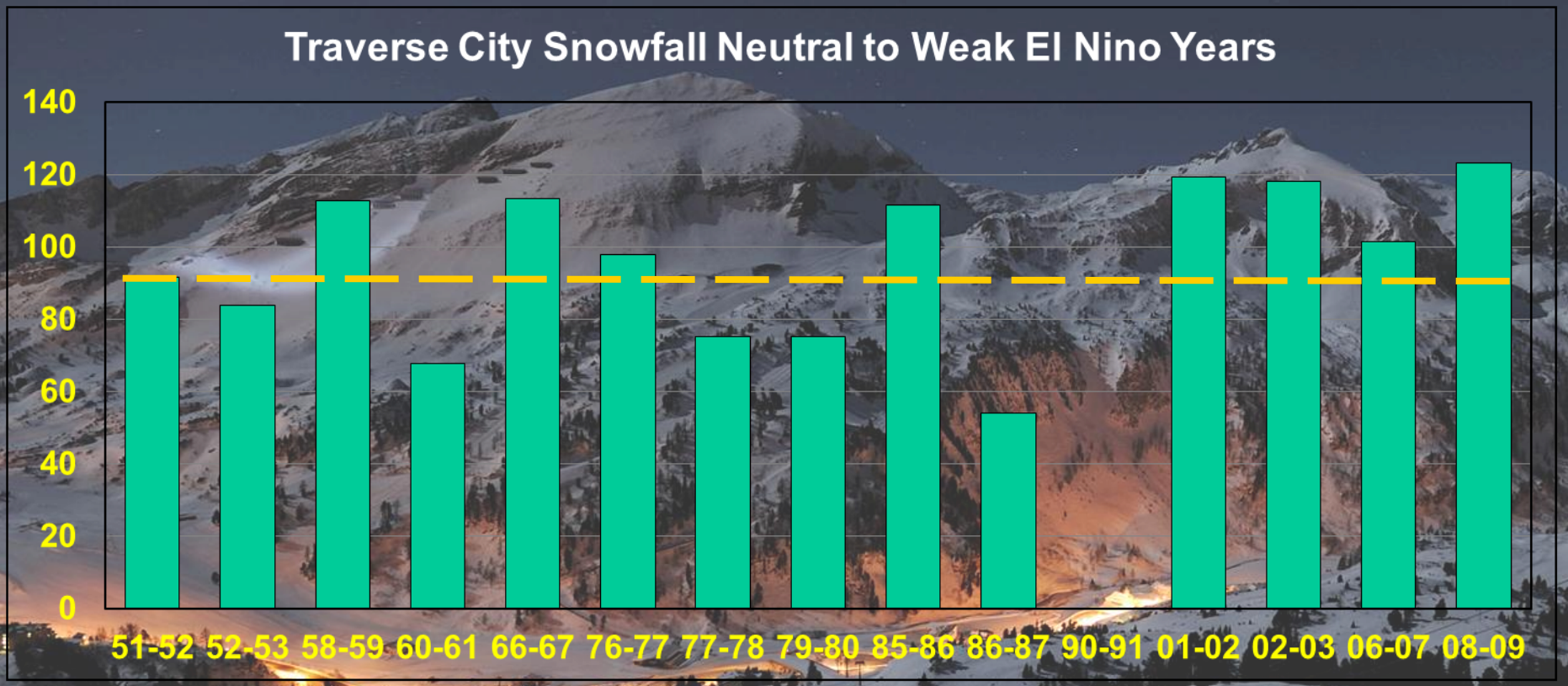
Let's Look at Some Snowfall Data



Long Term Average (1950-2011): 143.2"

Average for Analog Years: 147.7"

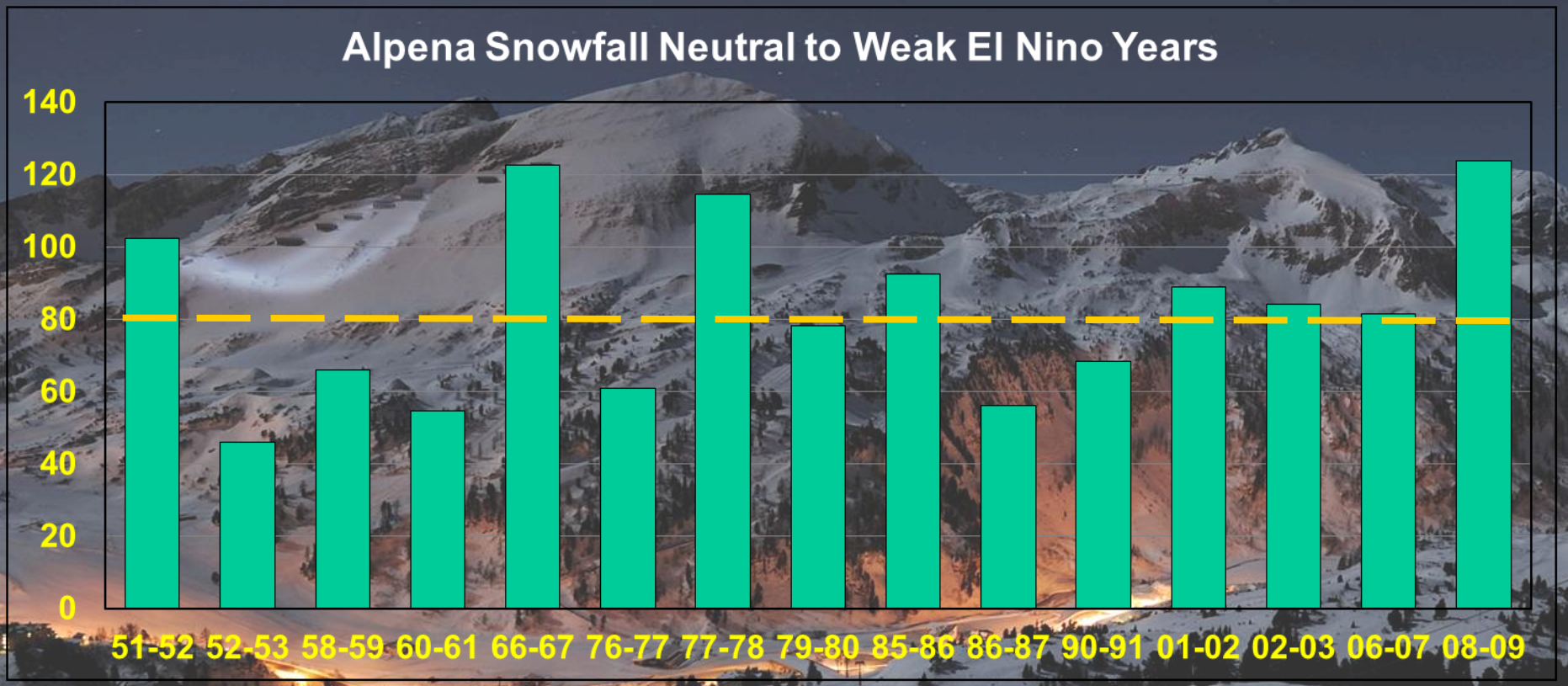
Let's Look at Some Snowfall Data



Long Term Average (1950-2011): 92.0"

Average for Analog Years: 96.1"

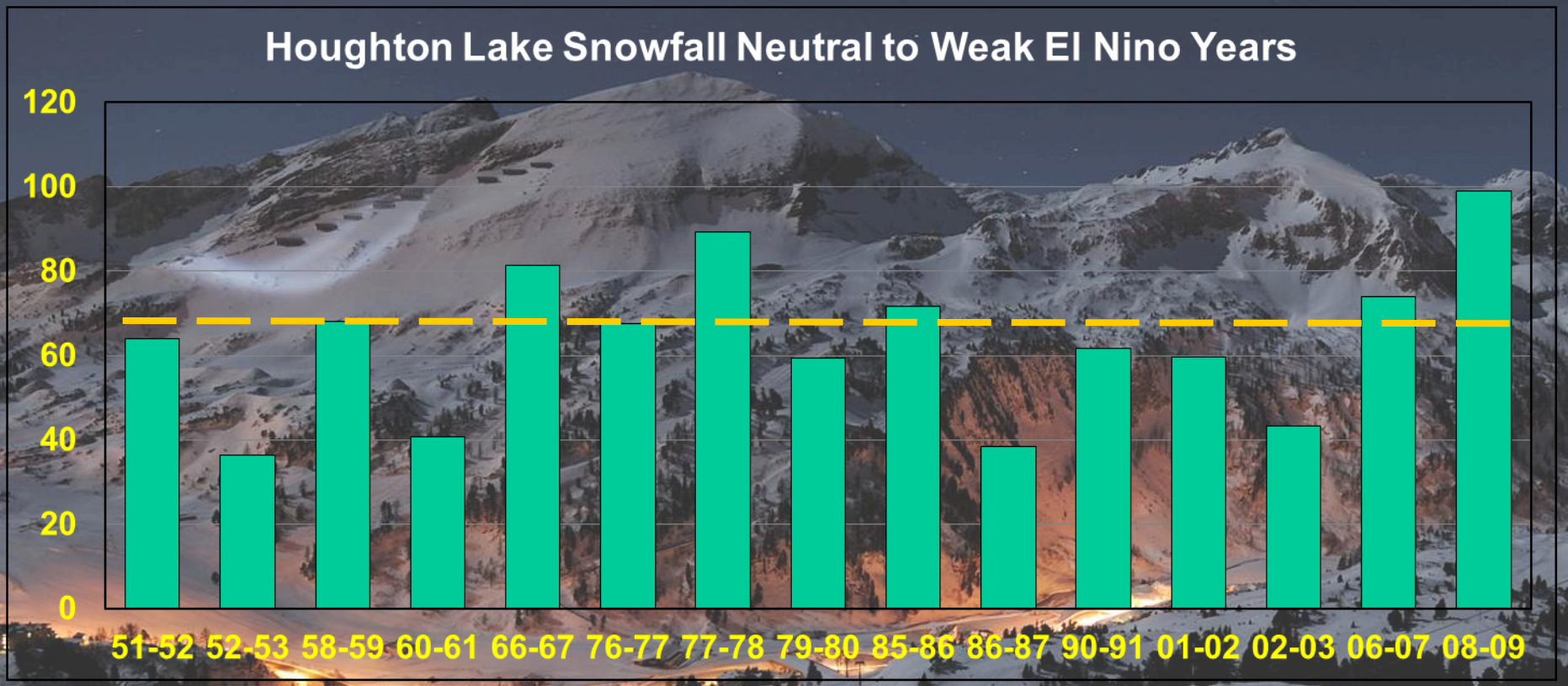
Let's Look at Some Snowfall Data



Long Term Average (1950-2011): 80.4"

Average for Analog Years: 82.7"

Let's Look at Some Snowfall Data



Long Term Average (1950-2011): 69.5"

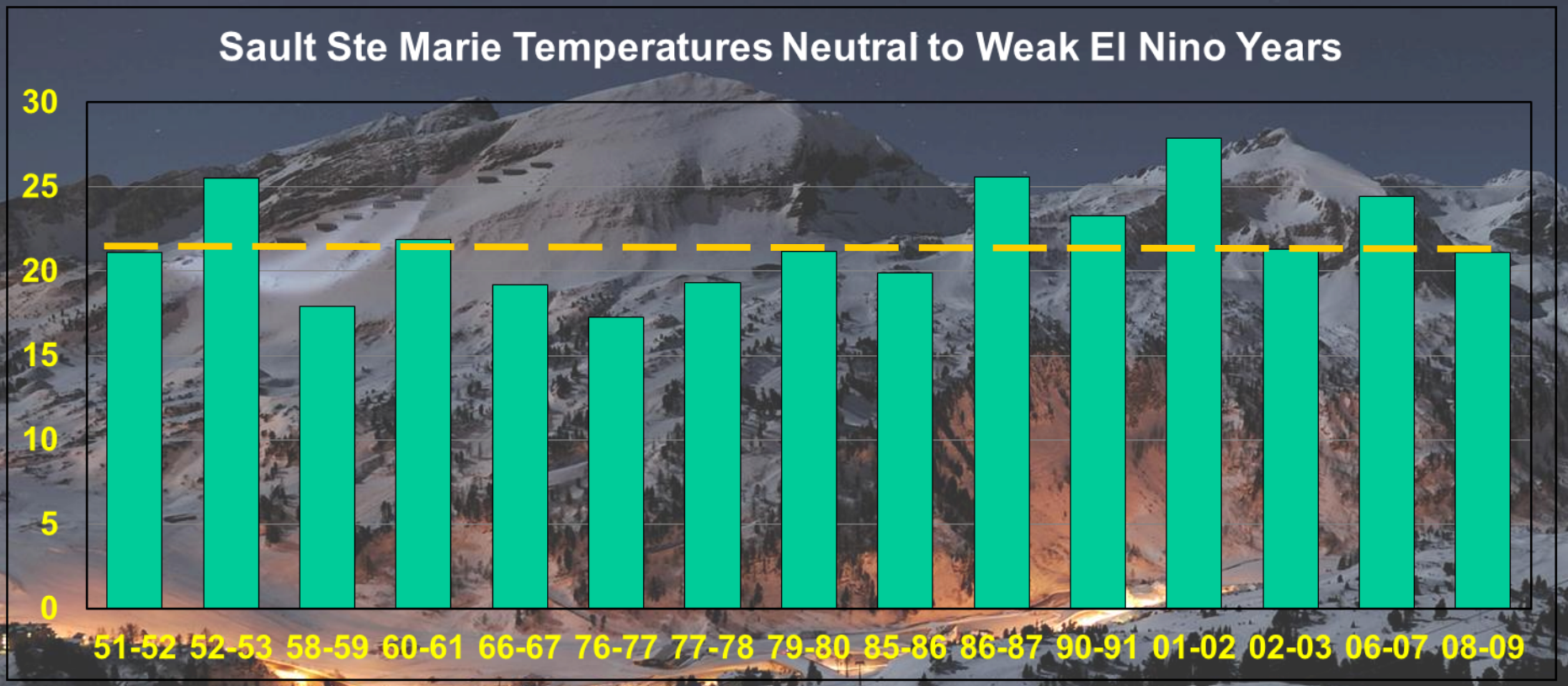
Average for Analog Years: 63.6"

Snowfall Outlook Based on Our Analogs

- Overall trend for normal to even above normal snowfall for just about all locations.
- Exception may be areas closer to Saginaw Bay with some hints that a good deal of the snow might be driven by lake effect

So What about Temperatures?

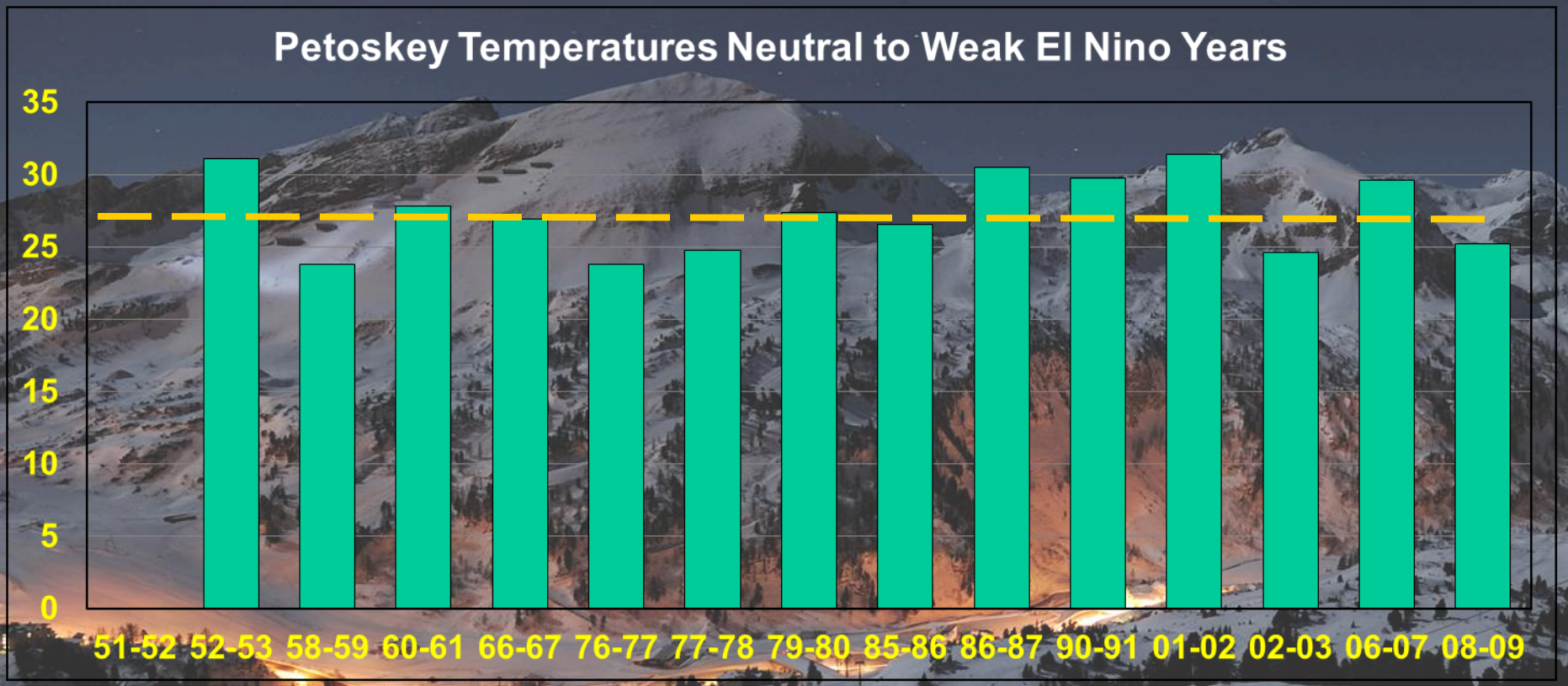
Sault Ste Marie Temperatures



Long Term Average (1950-2011): 21.7ºF

Average for Analog Years: 21.8ºF

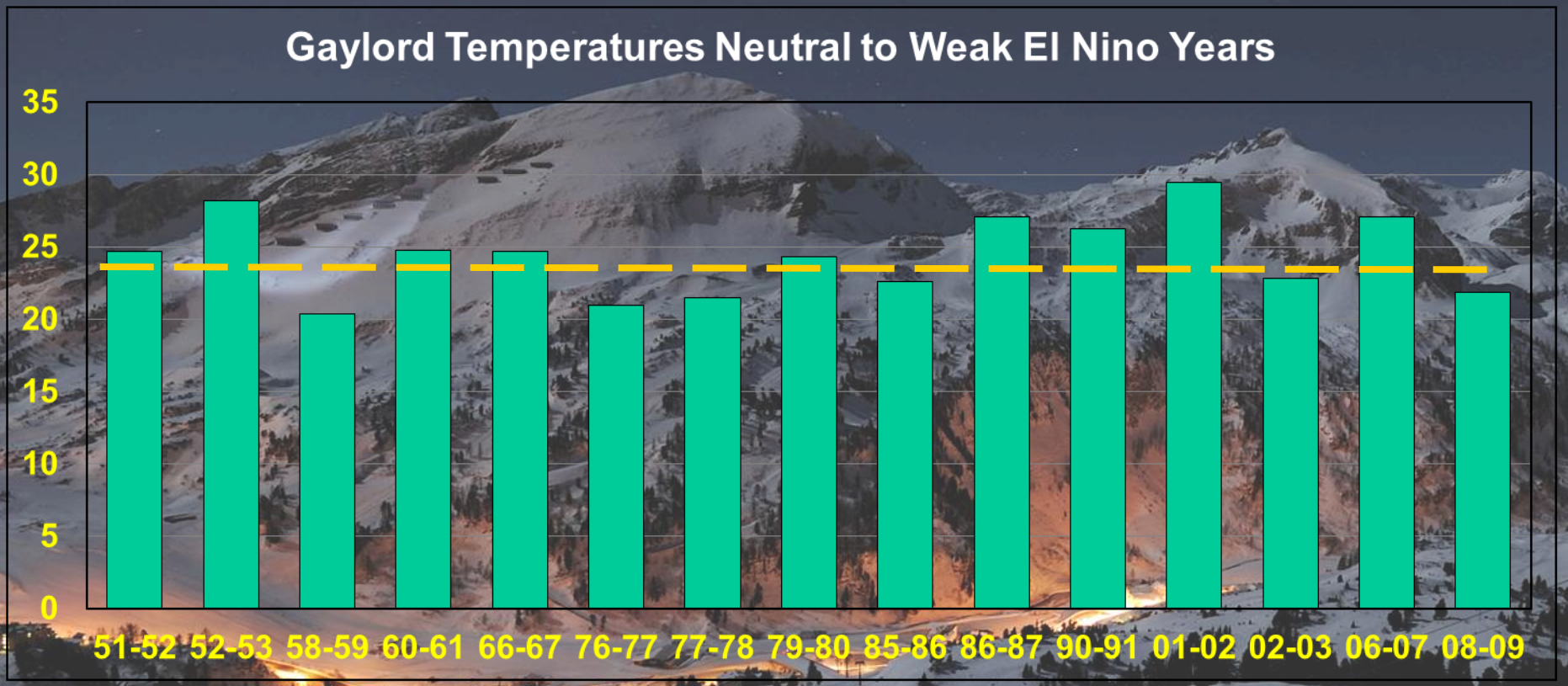
Petoskey Temperatures



Long Term Average (1950-2011): 27.5ºF

Average for Analog Years: 27.4ºF

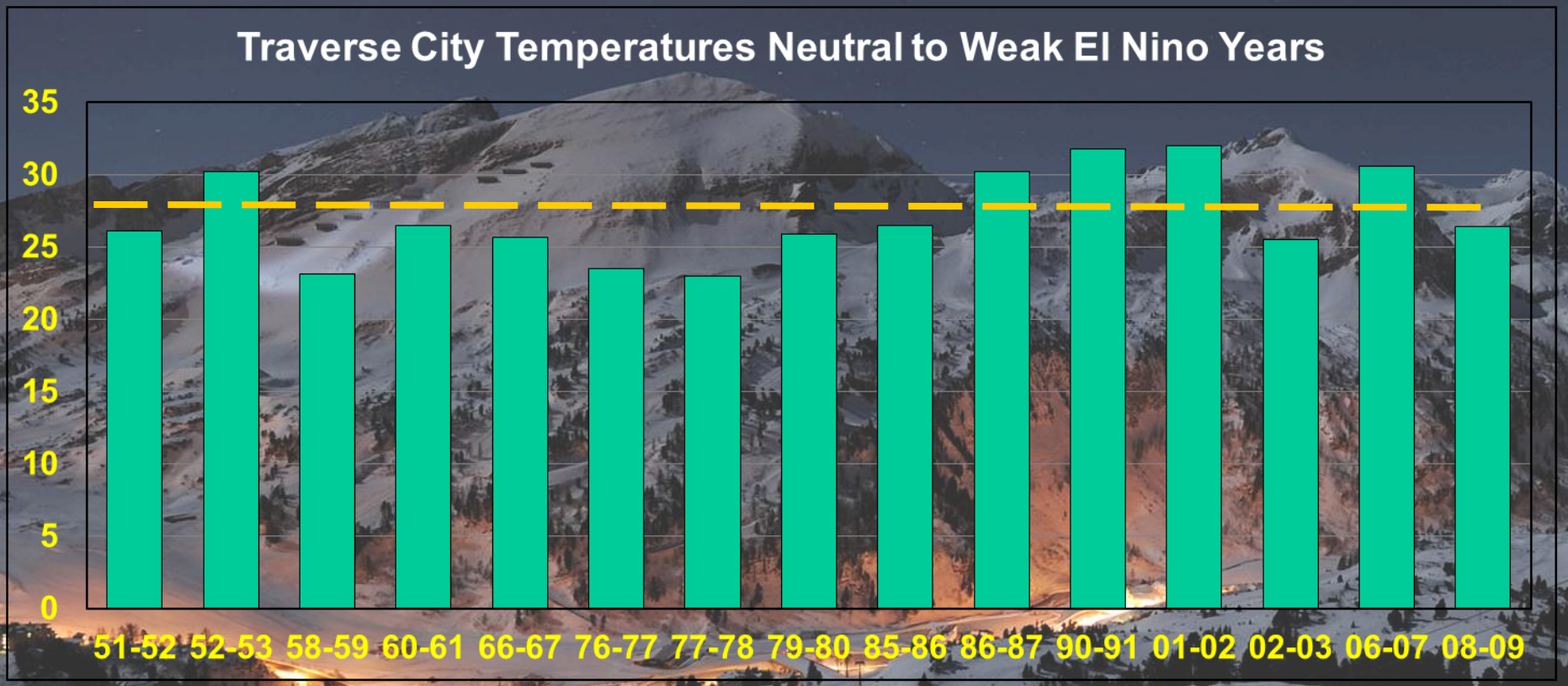
Gaylord Temperatures



Long Term Average (1950-2011): 24.7ºF

Average for Analog Years: 24.5ºF

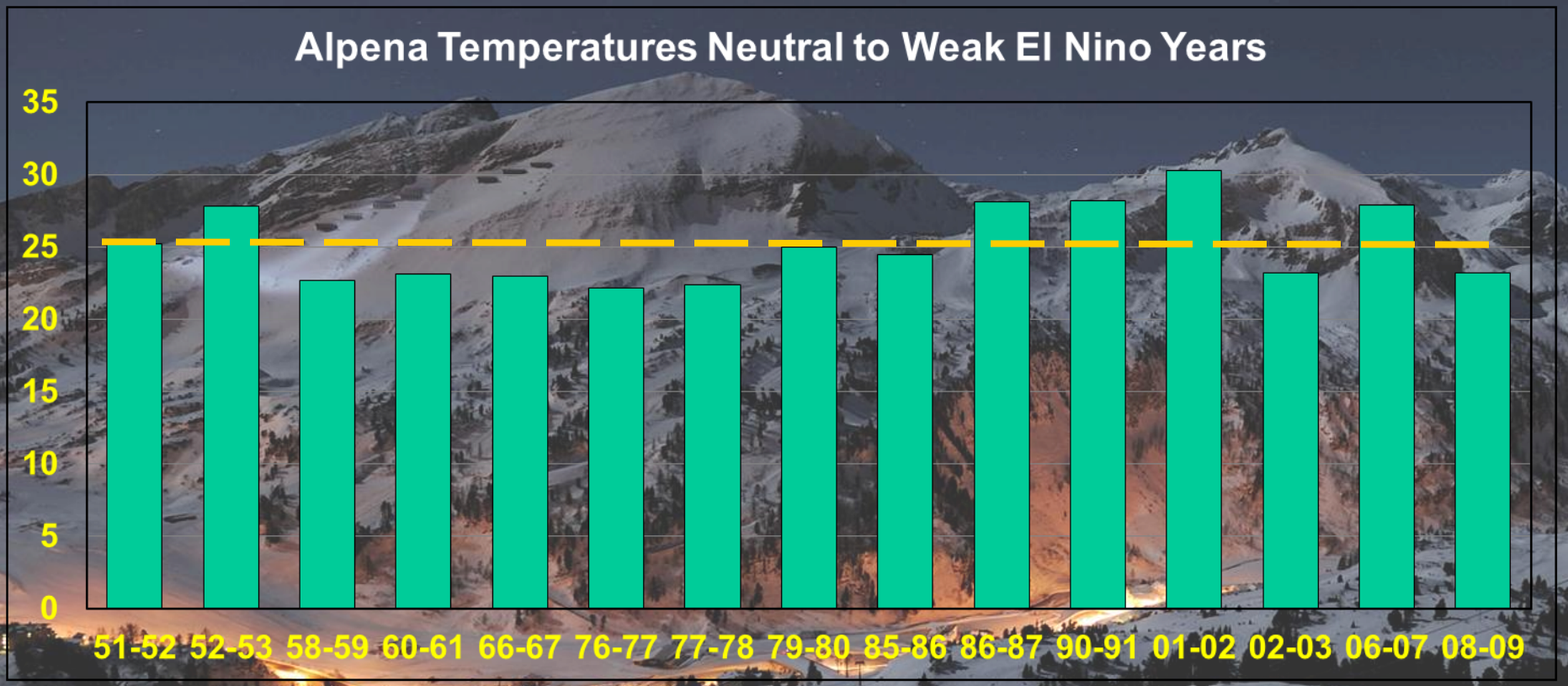
Traverse City Temperatures



Long Term Average (1950-2011): 27.3ºF

Average for Analog Years: 27.1ºF

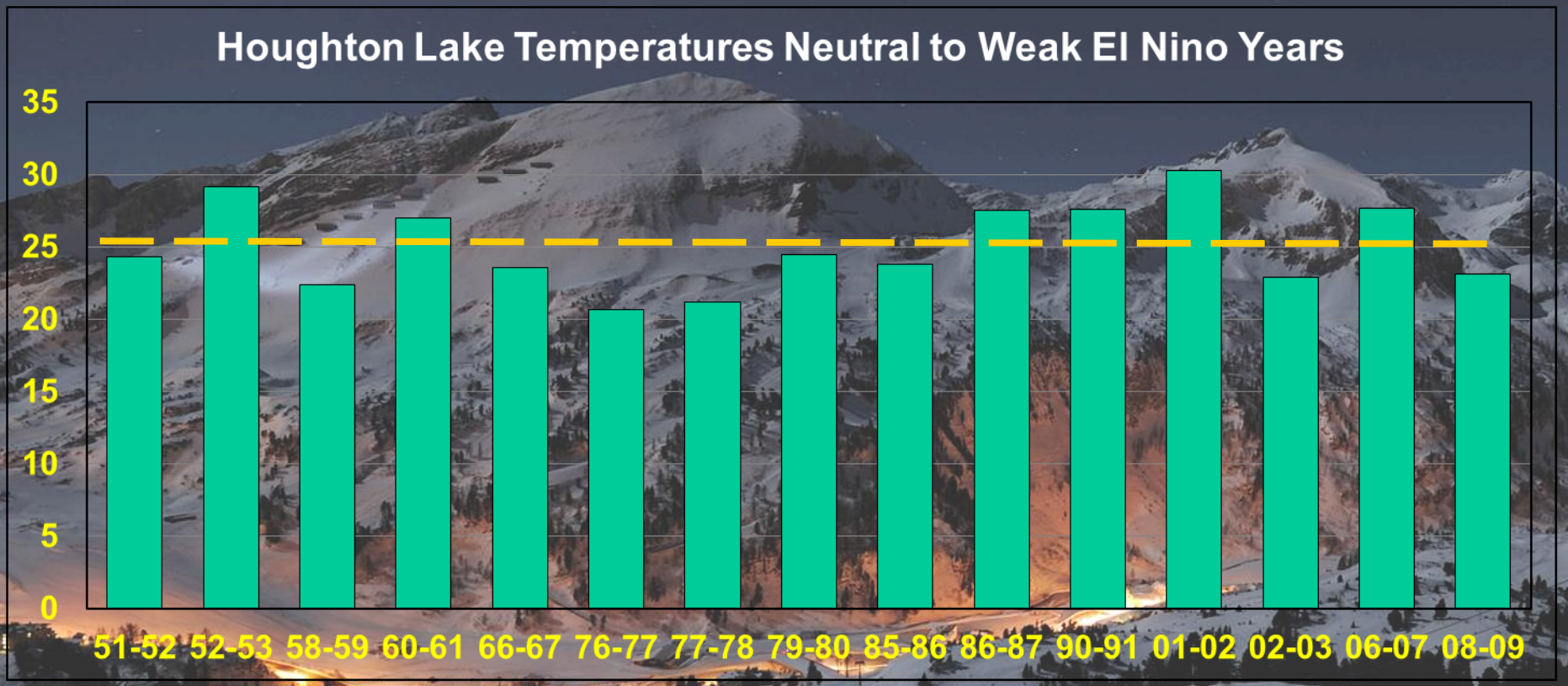
Alpena Temperatures



Long Term Average (1950-2011): 25.4ºF

Average for Analog Years: 25.1ºF

Houghton Lake Temperatures

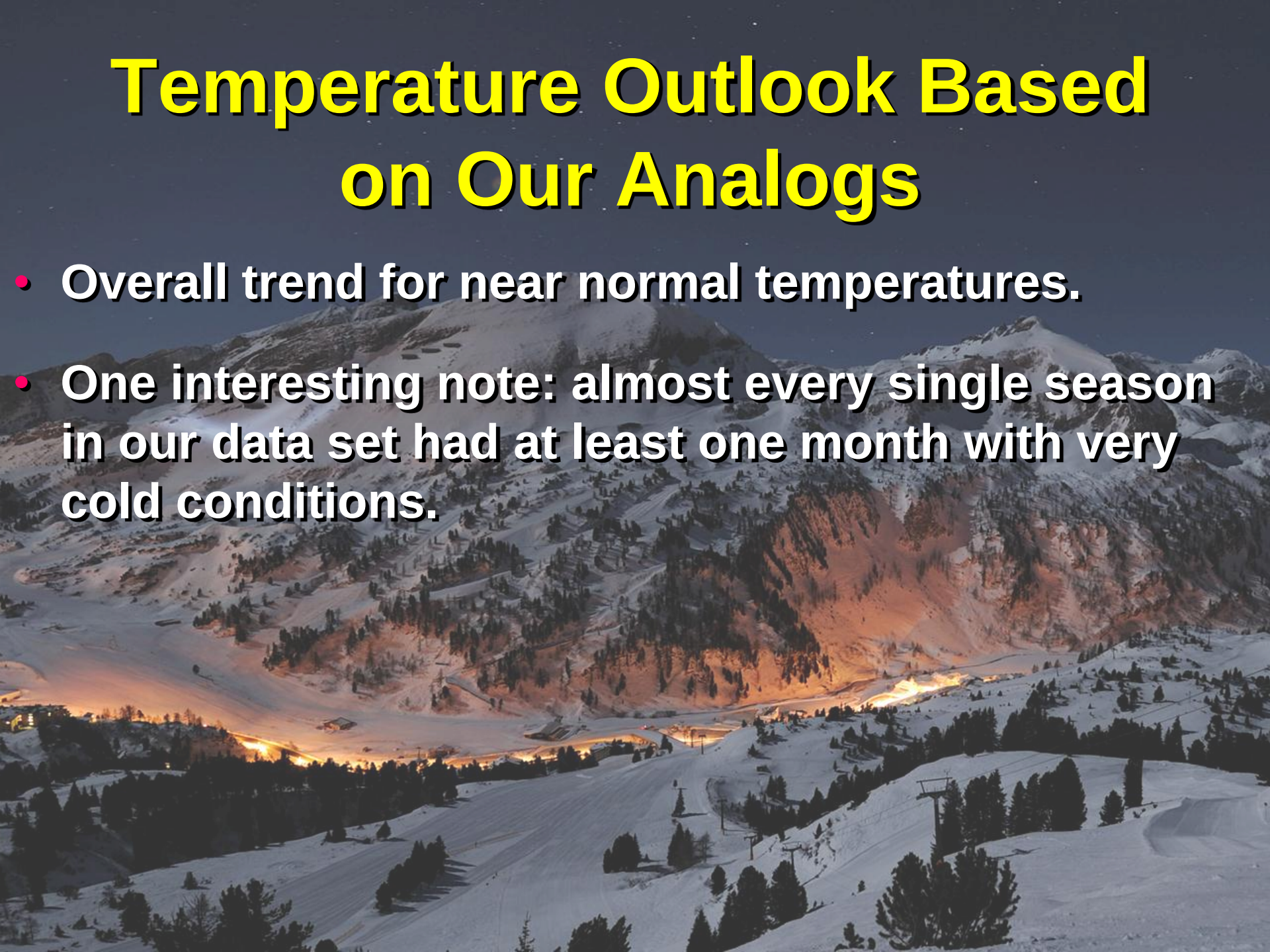


Long Term Average (1950-2011): 25.3ºF

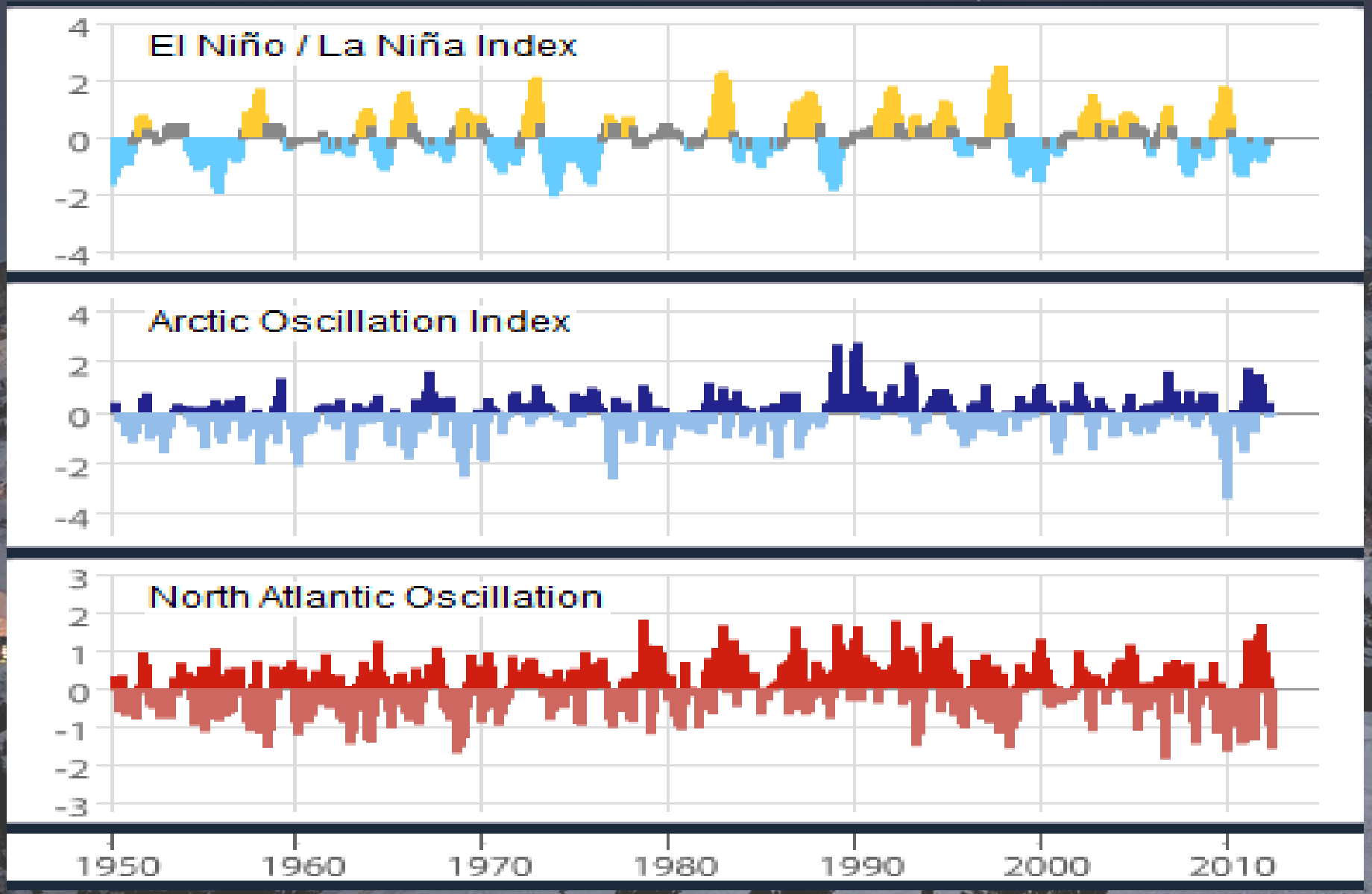
Average for Analog Years: 25.1ºF

Temperature Outlook Based on Our Analogs

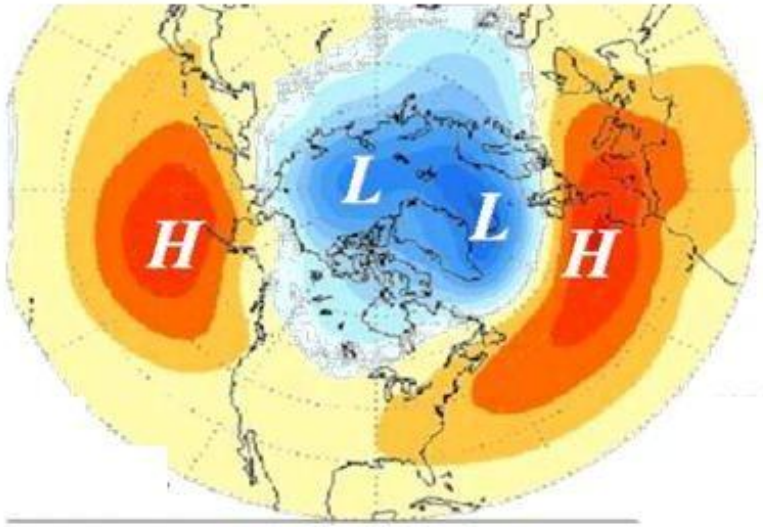
- Overall trend for near normal temperatures.
- One interesting note: almost every single season in our data set had at least one month with very cold conditions.



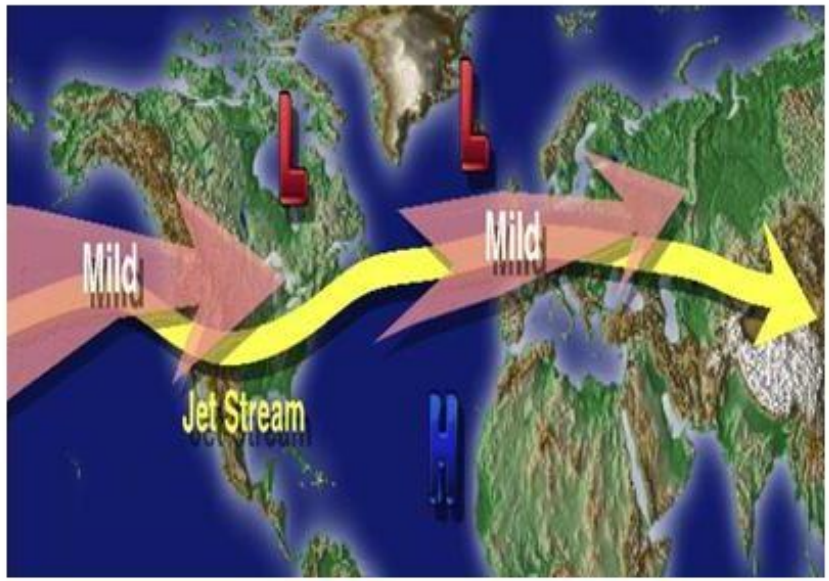
The North Atlantic Oscillation (NAO): A Wildcard in the Mix



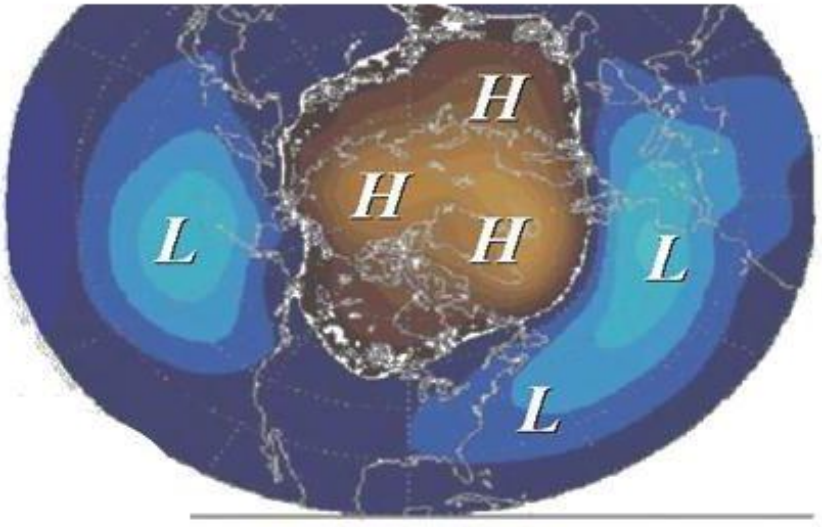
Positive Warm Phase AO/NAO



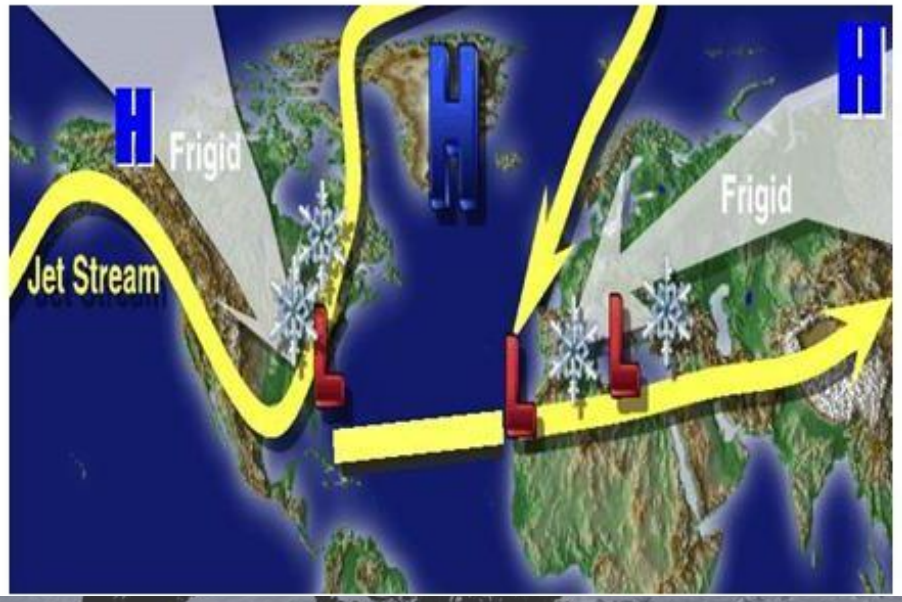
\- Pressures, and Temperatures +



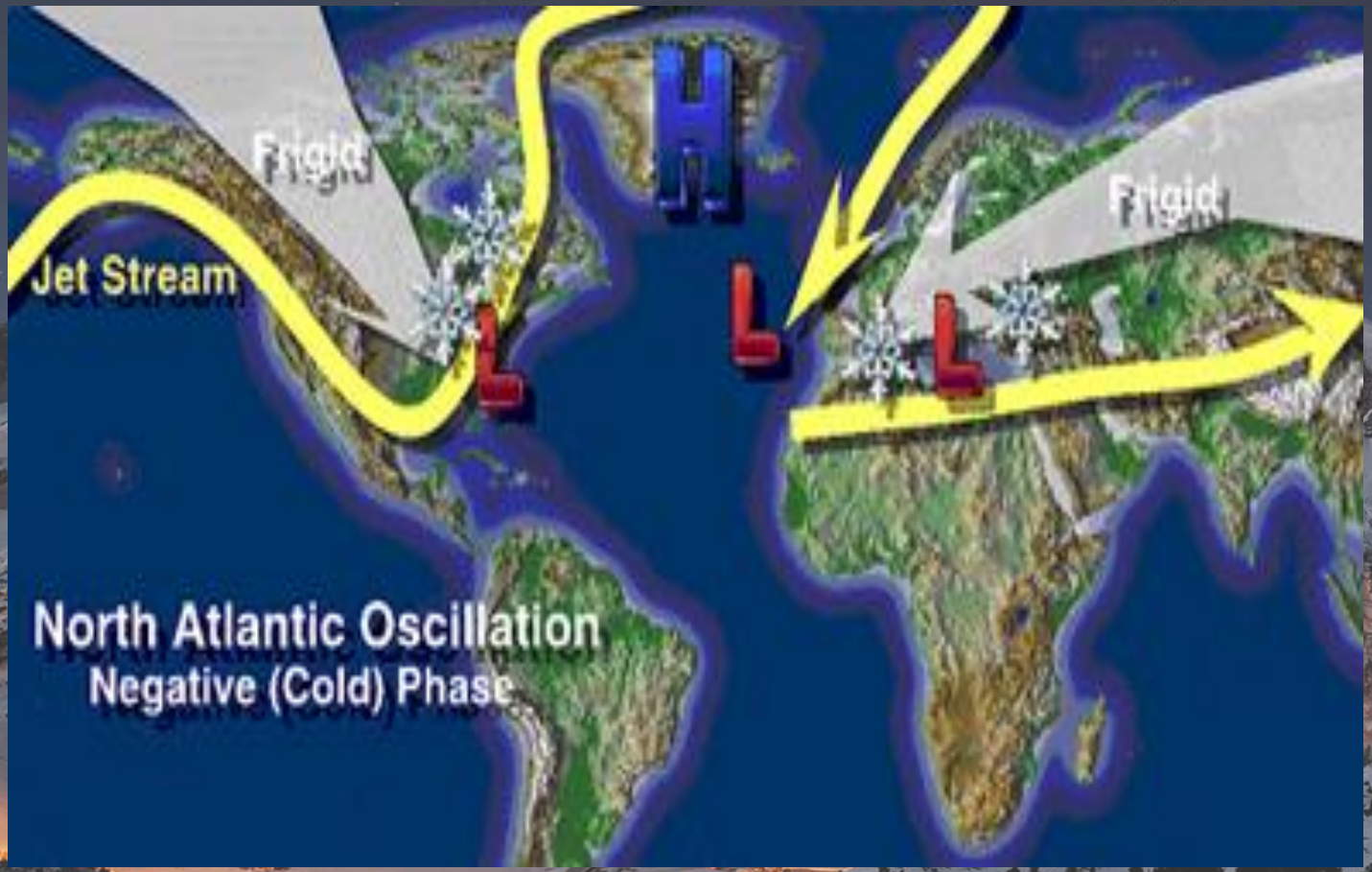
Negative Cold Phase AO/NAO



\+ Pressures and Temperatures -



Negative Phase of the North Atlantic Oscillation

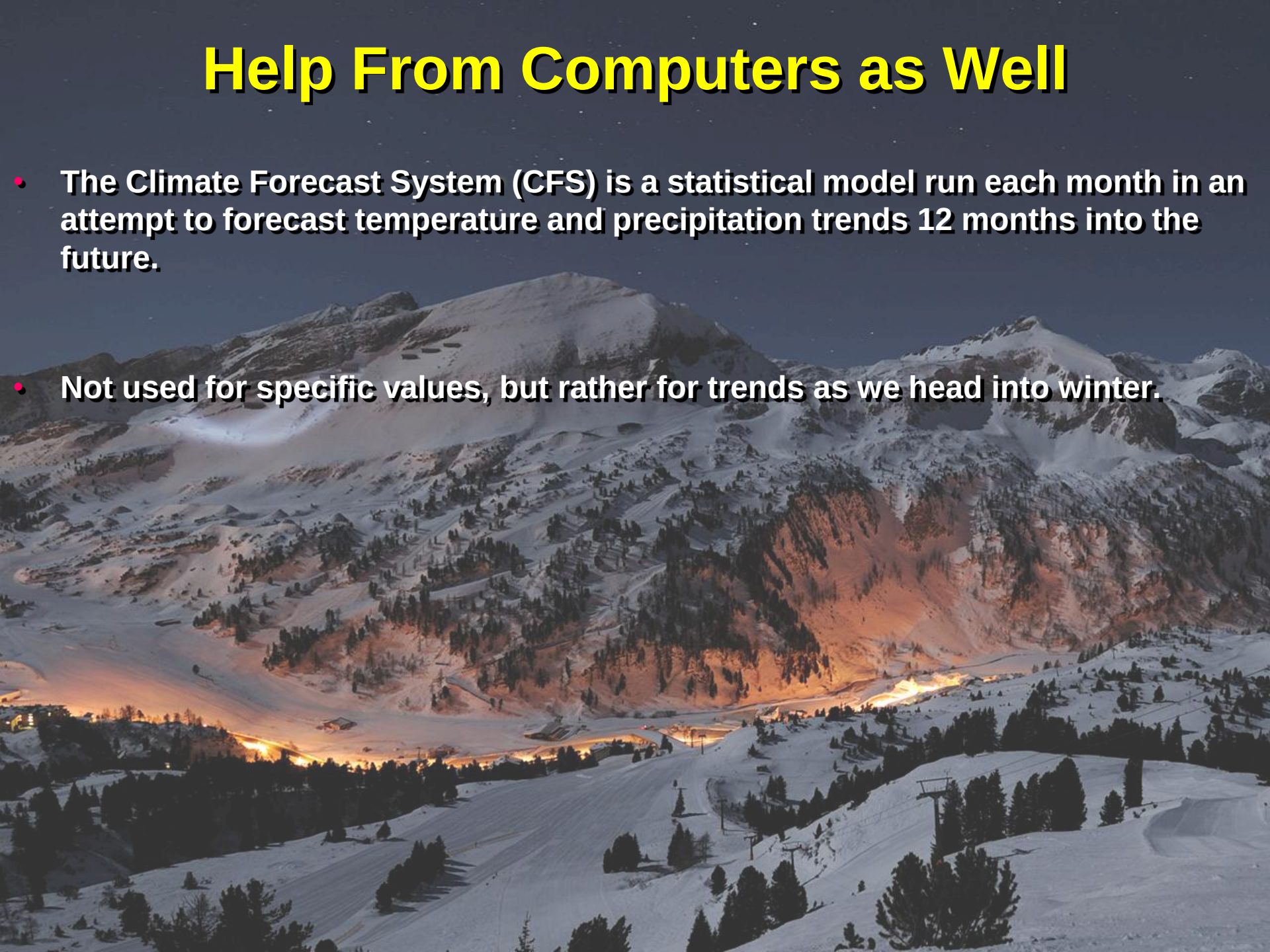


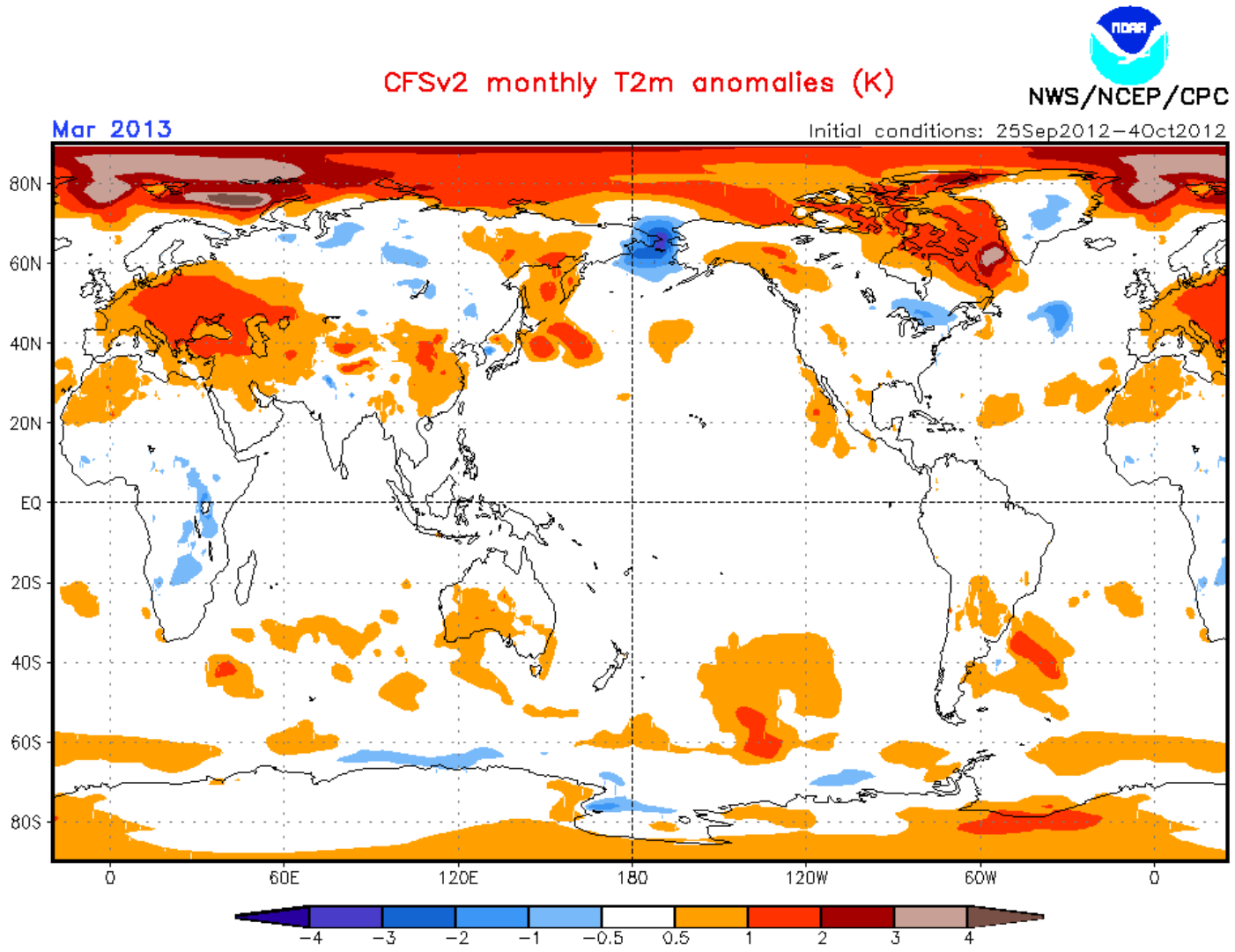
- Allows cold air to drop into the Great Lakes
- Forces prevailing storm track farther south and east
- At times, very conducive to heavy lake effect snows

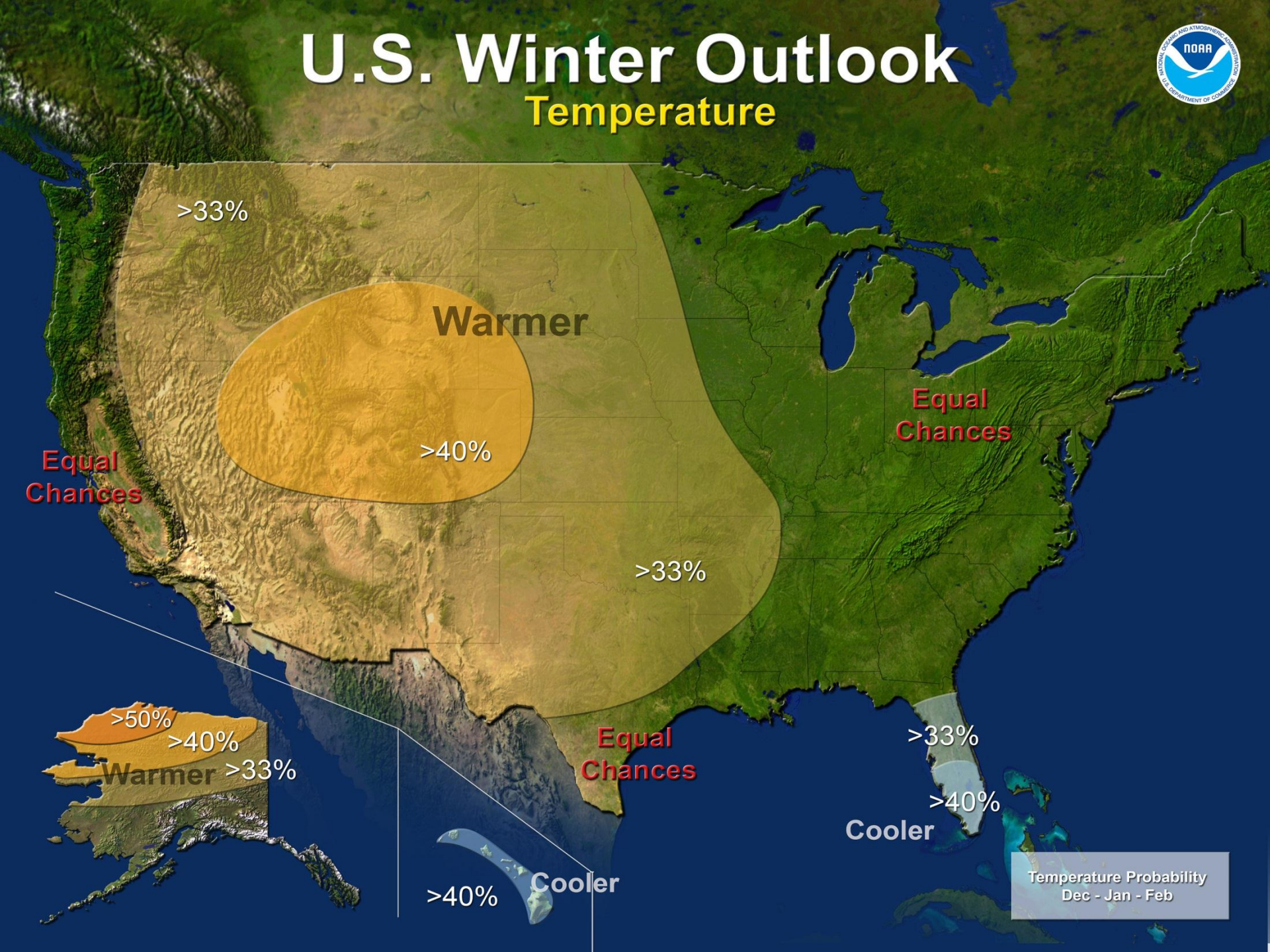
Help From Computers as Well

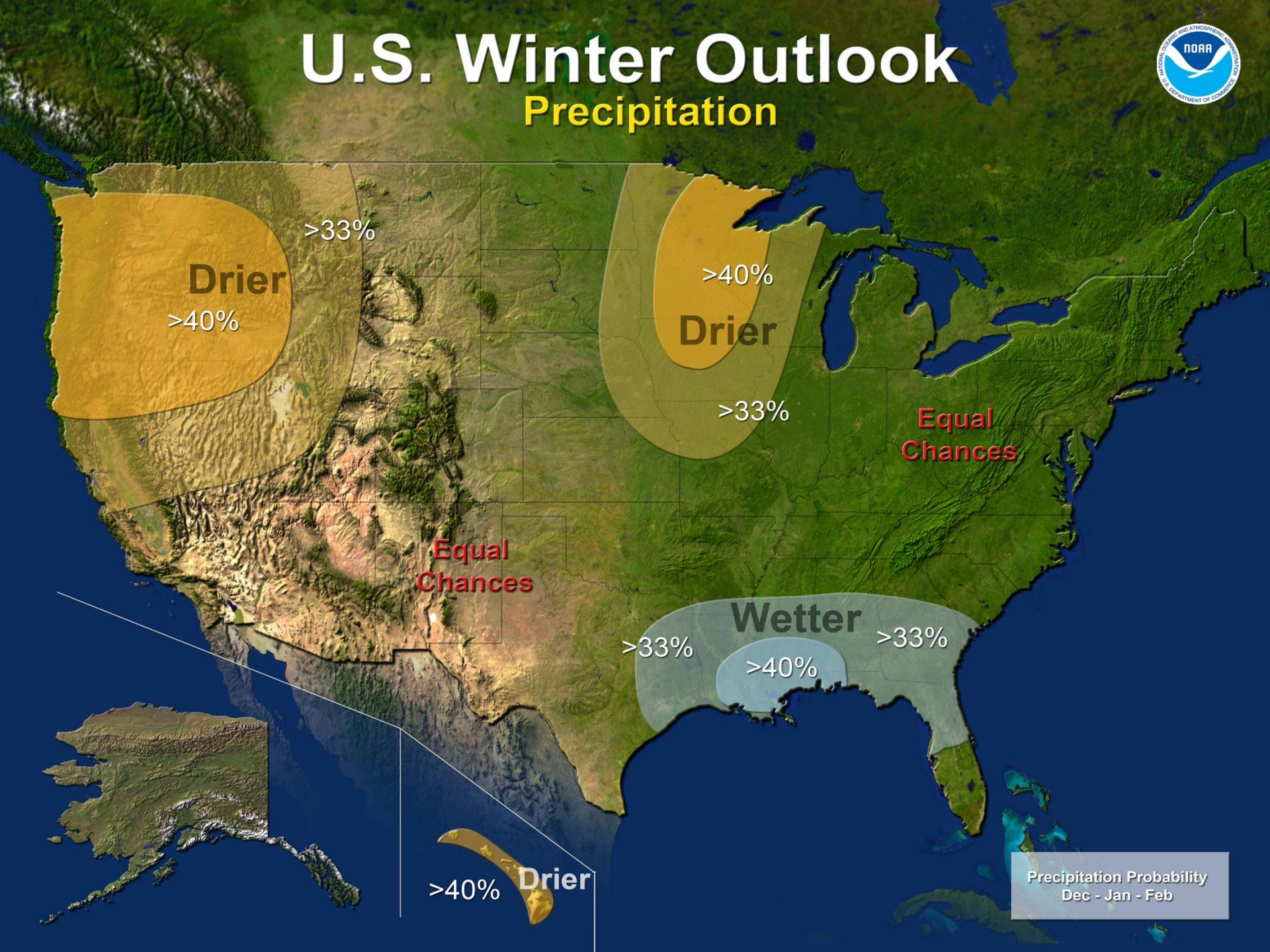
- The Climate Forecast System (CFS) is a statistical model run each month in an attempt to forecast temperature and precipitation trends 12 months into the future.

- Not used for specific values, but rather for trends as we head into winter.




CFSv2 monthly T2m anomalies (K)
NWS/NCEP/CPC
Mar 2013
Initial conditions: 25Sep2012–40ct2012
80N
60N
40N
20N
EQ
20S
40S
60S
80S
0
60E
120E
180
120W
60W
0
−4
−3
−2
−1
−0.5
0.5
1
2
3
4


U.S. Winter Outlook
Temperature
>33%
Warmer
>40%
Equal Chances
Equal Chances
>33%
>50%
>40%
Warmer
>33%
Equal Chances
>33%
>40%
Cooler
>40%
Cooler
Temperature Probability
Dec - Jan - Feb


U.S. Winter Outlook
Precipitation
>33%
Drier
>40%
>40%
Drier
>33%
Equal
Chances
Equal
Chances
Wetter
>33%
>33%
>40%
>40%
Drier
Precipitation Probability
Dec - Jan - Feb

Any Questions?

- http://www.weather.gov/gaylord
- http://www.cpc.noaa.gov

Thank you for coming this year!